was decidedly greater than that which occurs in the flap of much greater thickness and retaining its connection by a pedicle, which is ordinarily employed in plastic operations, and this fact should not be lost sight of in estimating the size of the flap to be taken. How large a surface may be successfully covered by this method at once can be determined only by experiment. The surface covered in the case reported was larger than that in either of Wolfe's cases; in each of those it was about the same size and somewhat less in length than the free border of the lids. If the attempt were made to cover a much larger surface at one operation it would probably be better to apply more than one graft, both on account of the greater convenience this would give of obtaining sufficient skin for the purpose, and because the difficulty of getting the thin graft to lie flat must increase with its size.

Wolfe took the precaution to set the flap so that the edges of the surrounding skin overlapped it and answered the purpose of stitches. The experience of the above case shows that such a procedure is evidently unnecessary, and certainly if employed here, union at the edges could not have taken place so readily and evenly. Of course the surface laid bare should be made as smooth and clean as possible, and hæmorrhage from it should be checked before the graft is placed in position.

But is it absolutely necessary that the transplanted material should be so thin and so carefully freed from all subcutaneous tissue? Wolfe was led to think so from observing the behavior of flaps in which connection was retained by a pedicle, where the operation was only partially successful. The occurrence of serous discharge and suppuration in such cases he regarded as the result of an effort to throw off the connective tissue previous to adhering. This consideration is not, however, convincing. A stronger argument is found in the fact that in his first case, in which the flap was divided into three pieces, one piece, supposed to have been sufficiently freed from connective tissue during removal, was placed in position without further preparation and in great part sloughed, while the other two pieces, from which the connective tissue was carefully cleared after their removal, lived. Moreover, experience has shown the successful application of minute skin grafts to be dependent on their freedom from subcutaneous tissue. More evidence is desirable definitely to settle the question.

PAIN AS A SYMPTOM IN FACIAL PARALYSIS, AND ITS CAUSE.[1]

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When describing facial paralysis many or most authors make no mention of pain as an accompanying symptom, unless it is stated that

[1] Read before the Boston Society of Medical Sciences.

sensation is not affected. Erb, in Ziemssen's Cyclopædia, mentions that there may be a complication with diminished sensation in the region of the fifth nerve. He also mentions neuralgic pain as a prodrome, and pain in the region of the ear and that half of the face affected, sometimes hours or days previous to the paralysis, as was seen in one of the following cases. (Case V.) But he does not mention that pain is a frequent accompaniment of facial paralysis which sometimes does not appear until after the paralysis.

In more than half the cases of rheumatic facial paralysis which I have seen, this symptom is mentioned. I have seen but one case of traumatic facial paralysis, following a blow on the side of the head; in that case pain was not mentioned. Instances of paralysis from diseases within the cranium would hardly come within the design of this article.

A brief review of several cases will show the nature of the pain, its distribution, and its relation to other symptoms. Unfortunately, many of the cases were imperfectly examined in regard to taste, salivary secretion, and hearing.

Case I. Miss F., about three weeks before I saw her, was exposed to a draught of air in the cars. The next morning on waking she found the left side of her face paralyzed. This was a characteristic case with loss of reaction to the faradic current, reaction retained for the galvanic current; the muscles responded to five or eight cells, the facial nerve slightly to ten cells; no diminution of hearing, no diminution of sensation; taste about equal on the two sides; the right pupil reacted to light better than the left. For two or three days after the origin of the paralysis there was pain in the left ear. This pain was not severe. The patient attended only a few times, but I subsequently learned that there was much improvement, though not complete recovery.

Case II. Mr. A. H. C. was never very strong. Three years before I saw him he was riding in a sleigh exposed to a cold, keen wind, in one of our western Territories. He was chilled, and caught a severe cold. He woke next morning with paralysis of the right side of his face. During the afternoon of the next day he had severe pain in the right jaw, which lasted a few days, diminished slowly, and finally disappeared. At times the pain extended over the whole of the right side of the head. When seen three years after, the right side of the face was completely paralyzed, no voluntary motion, the eyelid not fully closed, taste diminished if not lost on right side of tongue; when he winked, the right angle of the mouth was twitched up, and on closing the eye that angle of the mouth was drawn up. Watch was heard at two and one half feet on right, at eight feet on left. A very strong faradic current caused some motion of the muscles on the right (which muscles moved is not stated); fifteen to eighteen cells caused a slight motion on right and much stronger action on left.

Case III. Mrs. T. gave the usual history of paralysis on the right side after riding in the wind. There was pain on the right side behind the ear, which streamed up to the eye and down the neck and along the lower jaw; this pain continued more or less for a fortnight. For several days the teeth on the right side ached. There was a tender spot behind the ear. There was in this case a slight loss of sensation on the right side. Over the malar bone two points were recognized at half an inch on the left, and only when an inch apart on the right; over the lower jaw at half an inch on the left, and only when three fourths of an inch or more distant on the right.

The patient said the tears did not flow from the right eye, and the right nostril did not discharge mucus; there was dryness and canker on the right side of the tongue; the taste was not noticed to be deficient by patient.

All the muscles of the right side of the face failed to respond to the faradic current. When the galvanic current was used the muscles reacted to fifteen cells; the nerve reacted to twenty cells, which caused the muscles at the angle of the mouth to move. Mrs. T. called but a few times at first, as she was then out of town and the trip to the city was too fatiguing. Subsequently she was seen again, and improved very much under electrical treatment.

Case IV. Mrs. J. J. B. was sent to me by Dr. Edson of this city. She was confined early in November, lost considerable blood, and nursing was a severe tax. Four weeks after confinement the left side of her face was paralyzed, and this paralysis slowly increased until at the end of the third day it was at its full development. There was severe pain behind the ear and running down the neck to about the angle of the jaw, which continued ten days. Sensation was somewhat impaired. When seen there was total paralysis of the muscles of the left side of the face; there was no affection of taste; the palate was straight, and the watch was heard at five feet with the right ear, and at ten feet or more with the left ear. The faradic reaction was entirely lost on the left. The galvanic muscular reaction was exaggerated on the left for the muscles about the mouth. A little more than two months after the origin of the paralysis the nerve reacted to thirteen cells, and a few days later voluntary control was regained to a slight degree, and the muscles of the lower part of the face responded to the faradic current.

Case V. Mrs. H. was sent to me by Dr. C. J. Blake. She had had severe pain in the left side of her face, especially in and behind the ear. There had been tender points over the mastoid, also at each point of exit for the branches of the fifth nerve. There was at first diminished sensation over the parts where pain was felt, later hyperæsthesia. After this she found in the morning that she could not shut the left eye, and the face was drawn to the right. When seen two weeks after the

origin of the paralysis, the pain still persisted, at times so severe as to prevent sleep; there was a tender spot behind the ear at the point of exit of the auricular nerve. The eye was only partially closed; the whole of the left side of the face was paralyzed. The faradic current caused the orbicularis palpebrarum to contract, but all the muscles about the mouth did not respond. The reaction to the galvanic current was perhaps slightly diminished, but a few days later was increased. The power of the will was nearly recovered in ten days, and then the galvanic current applied to the facial nerve caused the muscles to contract.

It is evident that in this case all the fibres of the seventh nerve were not equally affected; for some lost their reaction to the faradic current, and others, while paralyzed, still retained that reaction. In this respect there is a resemblance to the case reported by Bärwinkel.

Several points of interest in these cases must be passed without comment: as variations in hearing between the two ears, the condition of the sense of taste, and the change in reaction to the faradic and galvanic currents while the patients were under treatment. The object of this paper does not include these subjects.

These cases are sufficient to illustrate the point under consideration, and are the only ones where the nature and the seat of the pain were accurately recorded; in others the report is indefinite.

As to the cause of this pain, it is quite possible that the fifth nerve in passing through the foramina to reach the face should be affected similarly to the facial, and this was probably so in Case III., where there was diminished sensation over the malar bone and over the jaw; perhaps the same is true of Cases IV. and V., where the physicians stated that there had been some defect in sensation, without specifying exactly the region affected. In such cases there would be a combined rheumatic affection of the facial nerve and certain branches of the fifth pair; but this explains only a few cases, since many times the pain has been confined to regions not supplied by the trifacial, or at most supplied by that in common with other nerves. In seeking for an explanation of the distribution of the pain, and in deciding whether a rheumatic affection of the facial alone will explain it, we must notice the anastomoses of that nerve. These are numerous; the anastomosis with the auditory nerve would not give the facial any sensory fibres; next is the greater superficial petrosal nerve, which unites the ganglion geniculatum of the facial and the spheno-palatine ganglion. In this nerve are found motor fibres which pass to the muscles of the soft palate, also probably sensory fibres of taste which pass from the fifth to the seventh, subsequently to return by the chorda tympani; it is quite possible also that fibres of common sensation pass from the fifth to the seventh, though this is not proved. Next is the anastamosis with the

tympanic plexus; this plexus receives branches from the carotid plexus, from the otic ganglion and from the glosso-pharyngeal nerve. It is impossible to decide as to the direction or nature of the fibres passing through this anastomosis. The chorda tympani unites the facial with the third division of the fifth; the fibres for taste pass through this from the facial to the tongue; it is also probable that a few motor fibres pass from the facial to the muscles of the tongue; secretory fibres pass from the facial through the chorda to the submaxillary and sublingual salivary glands; it is improbable that fibres of common sensation pass from the fifth through the chorda to the facial. Just before its exit from the stylo-mastoid foramen the facial receives an anastomotic branch from the auricular nerve, which is a branch of the pneumogastric, and passes through a canal in the temporal bone crossing the facial nearly at right angles. By this anastomosis it is almost certain that the facial receives sensitive fibres. The auricular nerve, after leaving the mastoid canal, forms another anastomosis with the posterior auricular of the facial. After leaving the stylo-mastoid foramen the facial sends a branch which anastomoses with the glosso-pharyngeal, but whether it receives sensitive fibres or merely gives motor fibres to the branch of the glosso-pharyngeal to which it sends its anastomosis is not certain. On the cheek near the anterior border of the ascending ramus of the lower jaw an anastomosis is formed between the branches of the facial and the auriculo-temporal, a branch of the third division of the fifth. The terminal branches of the facial and the fifth frequently anastomose with each other; there are also anastomoses with the branches of the cervical plexus.

Of these various anastomoses, those which are the most important as possibly contributing to the supply of sensitive fibres to the facial are the greater superficial petrosal and the auricular nerves, especially the auricular. This latter nerve is a branch of the pneumogastric which arises from the jugular ganglion or from the trunk of the nerve just below, receives a small branch from the petrosal ganglion of the glosso-pharyngeal, and enters the mastoid by a special canal. This canal crosses the Fallopian aqueduct nearly at right angles, and at the point of crossing the auricular and facial form an anastomosis. The terminal branches of the auricular are distributed to the external auditory meatus and to the auricle. Another anastomosis with the facial is also found near the exit of the auricular from the mastoid process.

It will be seen then that the facial nerve receives sensitive fibres while it is still within the bony canal, and it is not at all surprising that the same rheumatic swelling which causes the paralysis should also give rise to pain. In studying the distribution of this pain the anatomy of the auricular nerve is especially important. In Cases I. and V. the pain was in the ear; in Cases I., III., IV., and V., behind the ear; in Cases

II., III., and IV., along the lower jaw; in Case III. it streamed up to the eye, and in Cases II. and V. the whole of the side of the face was at times affected. In most of the cases the pain was in the ear and behind the ear, the regions to which the auricular nerve is distributed; and in Cases III. and V. there was a tender spot behind the ear at the point of exit of the auricular nerve.

The anastomosis of the auriculo-temporal nerve with the facial occurs only after the division of the latter nerve external to the stylo-mastoid foramen. The lower of the three branches of the facial is not a factor in this anastomosis. The sensitive portion of this lower branch must then be derived either by sensitive fibres turning back at sharp angles and then taking another turn, or it must come from a previous anastomosis. The latter is more probable, especially as the lower border of the ramus and the angle of the lower jaw does not receive sensitive fibres from the fifth. Thus the pain along the lower jaw in Cases II., III., and IV. would be explained by the implication of the auricular before sensitive fibres are given to the facial, or by an affection of the latter after receiving such fibres. In no case was pain referred particularly to the front of the ear alone.

The cases in which more extensive pain was felt may have been, as already suggested, due to an affection of the fifth nerve in its foramen. There is, however, another explanation which might be true in some cases. The auriculo-temporal nerve passes round the neck of the jaw, between it and the styloid process, and it is only slightly separated from the facial nerve. The same influence which caused a rheumatic affection of the facial might act upon this nerve and so cause pain in the side of the face. It is almost an every-day occurrence to notice that in case of severe pain the sensation is not limited to the region of the nerve affected but is referred to other parts in the vicinity; hence a referred or reflex sensation of pain may explain the general headache of which patients sometimes complain. Inasmuch then as pain in all these cases was felt in the region over which the auricular nerve is distributed, as in two cases there was a tender spot at the point where this nerve makes its exit from the mastoid process, and as this nerve passes through a bony canal which communicates with the canal through which the facial passes, it is reasonable to conclude that the same lesion which causes the facial paralysis causes the pain; sometimes the rheumatic swelling commences in the sheath of the auricular; then pain is the first symptom, as in Case V. Sometimes the facial is first affected; and in either case the lesion extends by contiguity to the other nerve, or both may be affected simultaneously.